Office of the State Controller

Workforce Planning Prototype Project
Summary Report

Building Enterprise Access
For NC's Core Operation Needs

Table of Contents

Project Background

In August of 2005, the NC Office of State Personnel (OSP), with sponsorship from the Office of the State Controller (OSC) and support from Information Technology Services (ITS), initiated a project with SAS to implement a prototype data warehousing and business intelligence application which would provide OSP necessary business information to assist with workforce planning. In addition to serving the immediate workforce planning needs of OSP, the prototype was sponsored through the Data Warehousing Initiative of the Statewide Business Infrastructure Program (SBIP – now referred to as BEACON). As a prototype data warehousing application, the Workforce Planning Prototype would also serve to prove out the value of data warehousing and business intelligence to address a specific NC business problem, as well as provide an initial project for implementing SAS technology under the recently expanded SAS Enterprise License Agreement. In addition, the project would allow ITS to gain valuable insights and knowledge to assist in the development of an enterprise approach to offering Data Warehousing capabilities in a shared services utility environment.

An initial Statement of Work defining the prototype scope and deliverables was delivered on August 2, and after a series of revisions a final version was submitted and approved on August 17, 2005. A project team was established with representatives from OSP, OSC, ITS, the Office of the State Treasurer and SAS, and a project kickoff meeting was held on August 22, 2005.

The goals of the project were defined as follows:

- Provide single repository for data from dissimilar sources.
- Enable the State of North Carolina to become more proactive/predictive rather than reactive with workforce planning process.
- Further the concepts of providing a reporting and analysis system for workforce planning and an enterprise data warehouse and make them visible to other entities within the State of NC.
- Provide access to workforce planning reports and analysis via an intuitive web-based portal.
- Deliver a scalable *(i.e. reusability)* solution that can easily be integrated into the State of NC enterprise architecture.
- Furnish training on the prototype system including data acquisition, system maintenance and end-user functionality.

Although the project team encountered a number of technical and procedural challenges throughout the project, a successful training and user acceptance test occurred on March 16, 2006. The feedback from the training and UAT is covered later in this document, as well as lessons learned and next steps.

Project Activities and Deliverables

Activities and Deliverables

The key deliverables of the project as defined in the SOW were:

- Workforce Planning Prototype Project Design Document
- Workforce Planning Prototype Application
- End User Training
- Workforce Planning Prototype Project Summary Document

In addition to the contracted deliverables, the following were also provided:

- Training Manual
- Installation and Configuration Documentation
- Project Load Documentation

The OSP Prototype Project Design Document was initially delivered on October 17, 2005, and after some minor revisions a final version was delivered and accepted on October 24, 2005. The Project Design Document provided the necessary design information to build out the OSP Prototype application.

After acceptance of the design, Zencos (a SAS partner and subcontractor) began work building the application on Zencos hardware using data from disparate sources. Revisions to the ITS infrastructure schedule were required, reflecting the actual effort necessary to prepare the hardware platform, install the SAS software, and deploy an operational development environment. This change caused the project to be extended for 6 additional weeks, necessitating a change order to revise the overall project schedule and costs. Once the ITS hardware environment was available in early January, 2006, and the change request was submitted and approved, work began in transitioning the application from the Zencos environment to the NC ITS environment. After a few initial technical issues were resolved, the SAS software was successfully installed and the application transitioned in early February, 2006.

Integration testing was performed in late February and early March, 2006, which led to training and user acceptance testing commencing on March 16, 2006. The Training Manual was delivered on March 21, 2006.

This Workforce Planning Prototype Project Summary Document serves as the final deliverable for the OSP Workforce Planning Prototype project.

Outstanding Issues

Two issues remained outstanding and were not resolved in sufficient time to be included in the final application deliverable. First, the retirement system data extracts obtained from the Office of State Treasurer only contained data on active employees. In order to effectively create viable predictive models for retirement, data is needed on both active and retired employees. Note that predictive models were built during the project based on the available data; however, the confidence in the accuracy of those models is very low due to the limited data used to create them. Once more historical data is loaded, the templates already created will make it relatively simple to refit the models to more relevant data.

Secondly, technical firewall issues prevented the ability to connect directly to the PMIS IMS database on the mainframe. Although this issue was eventually resolved, it was not until contingency plans had already been put in place to move forward with the original extracts provided to Zencos. Since those extracts only contained one year of historical data (vs. 15 years that was planned for extraction from the PMIS system), the amount of historical analysis available in the first rollout of the prototype is limited.

It is important to note that even with these limitations, all of the project goals listed in the Background section were met.

Project Outcomes

Project Objectives

The project met all of the goals defined in the Statement of Work and listed in the Background section.

Provide single repository for data from dissimilar sources

Within the context of the application, data was combined from PMIS, three State retirement systems and external data from the Bureau of Labor Statistics. SAS data management tools were utilized to transform and consolidate the data into a single repository. By utilizing the SAS tools, an application environment has been created that will allow the data sources to easily be modified or expanded in the future.

Enable the State of North Carolina to become more proactive/predictive

As mentioned previously, predictive models were delivered within the context of the application. In addition, several key analysts were trained on how to use SAS data mining and predictive modeling tools. Due to the limited amount of data available to the prototype application, the efficacy of the models created is in question. Once more historical data is loaded and the models refit, the State will be in a much better position to have true proactive and predictive capability.

Further the concepts for workforce planning and an enterprise data warehouse

Although the prototype was limited in scope, it addressed all areas of a full data warehouse architecture and life cycle. That includes data management, robust enterprise warehouse storage, sophisticated web-base reporting tools and advanced analytics.

Provide access to workforce planning reports and analysis via intuitive web-based portal

The reporting application was delivered as interactive web based reports. End users are presented with an initial login screen that allows the system to authenticate them, and then passes them to a web interface where they can select from available reports. Most of the reports are interactive and allow end users to sort, subset, drill down, add new category or analysis variables, and even create new calculated columns. In addition, user can save report layouts, print or export report details. Feedback from User Acceptance Testing indicated that the vast majority of users found the reports to be user friendly and intuitive after only a half day of training.

Deliver a scalable solution that can be integrated into the NC ITS Enterprise Architecture

The prototype was implemented on the Sunfire E25K hardware environment that NC ITS has targeted for the Enterprise Architecture and utilizes most of the SAS tools that would be utilized in that environment. A number of technical and procedural issues were encountered and resolved during the Workforce Planning Prototype project, which should result in a much smoother implementation for the Enterprise Architecture.

Furnish training on the prototype system including data acquisition, system maintenance and end-user functionality

Technical knowledge transfer was provided throughout the duration of the project on data acquisition and systems maintenance and administration. Two training sessions were held for end user, with overwhelmingly positive feedback.

User Acceptance / Business Value

Feedback collected from end users after the training and user acceptance testing was overwhelming positive. Most users found the application very user friendly and intuitive. In addition, they were surprised at how easily they could report on data that had originated in disparate systems. Several users commented on the value of being able to see the data in both graphical and tabular form.

The business value centered around how easy it was to get the information they needed through the interactive reports. Previously, users had to get reports from multiple systems and then manually combine those using tools like Microsoft Excel. The ability to sort, filter, drill-down or re-arrange a report on the fly will make it much easier and faster to get the information they need.

Many users also expressed the huge potential they foresee in using forecasting and predictive modelling. This will allow HR analysts to be much more proactive, rather than reactive. One user commented:

> *"I foresee enormous benefit from being able to develop, update and use a forecast model, using the integrated data provided by the warehouse system, that will project retirements on an annual basis moving forward. Not only can we provide the State with input on workforce planning, but we can anticipate fluctuations, particularly significant spike, and plan our business processes, personnel and resource needs accordingly."*

Lessons Learned

There were a number of lessons learned throughout the project which should be taken into account for any future projects of this types.

Include SB-991 and ITS Hardware Readiness as Sub Projects

Substantial delays occurred during this project due to not anticipating the time and effort required to get project approved and in place and to get the appropriate hardware environment ready. For future projects, it is important that these be incorporated as sub projects in the overall project plan, with risks and milestones managed appropriately.

Test and Validate all Data Access Early

Both of the outstanding issues were due to inability to access certain data sources. For future projects, these activities should be planned for as early in the implementation phase as possible so that any potential issues are surfaced and resolved or mitigated.

Don't Ignore Data Quality

Although data quality was specifically listed as out of scope for this project, data quality almost always exist and have to be addressed in order to have an acceptable end product. For future projects, time should be included in the scope of the project to assess and address data quality issues.

Next Steps

The Workforce Planning Prototype was designed and implemented as a limited scope prototype to prove out the value and technical feasibility of data warehousing and business intelligence in the State of NC environment. As such, the project was initiated with the understanding that future phases would expand on framework provided by the prototype and provide additional functionality. Through User Acceptance Testing and Project Summary Meetings, and number of key enhancements have been identified:

- Re-architect ETL process to read data directly from PMIS
- Populate additional PMIS history data from multiple years
- Populate both active and retired history from retirement system
- Address current data quality issues
- Automate and schedule recurring ETL process
- Refit predictive models based on expanded historical data
- Assess and add new reports based on user requirements and feedback
- Move application to a production environment

A proposal for the above enhancements has been developed and submitted to NC OSP, and is pending project approval and funding.